

MAR'S

CONJECTURAL INQUIRY INTO THE
RELATIVE INFLUENCE OF THE
MIND AND STOMACH.


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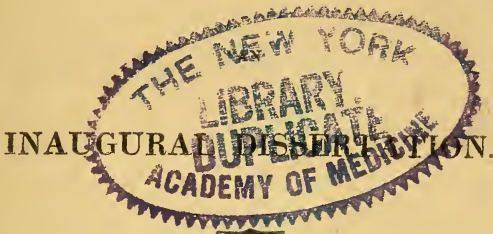
CONJECTURAL INQUIRY

INTO THE

RELATIVE INFLUENCE

OF

THE MIND AND STOMACH:



BY ELIAS MARKS,

OF CHARLESTON, SOUTH-CAROLINA.

“ There is such a reciprocal connexion and consent between the particular Thoughts and Affections of the Mind and the Body, that a change in one will always produce a change in the other ”

BOERHAAVE.

NEW-YORK:

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AN
INAUGURAL DISSERTATION;

BEING

A CONJECTURAL INQUIRY INTO THE RELATIVE INFLUENCE

OF

THE MIND AND STOMACH:

SUBMITTED

TO THE PUBLIC EXAMINATION

OF THE

TRUSTEES OF THE COLLEGE OF PHYSICIANS AND SURGEONS,

IN THE STATE OF NEW-YORK,

SAMUEL BARD, M. D. PRESIDENT,

FOR

The Degree of Doctor of Medicine,

On the 2d day of May, 1815.



PRELIMINARY.

“LES conjectures,” (says a celebrated writer,*) “sont le degré de certitude le plus éloigné de l'évidence; mais ce n'est pas une raison pour les rejeter. C'est par elles que toutes les sciences et tous les arts ont commencé: car nous entrevoyons la vérité avant de la voir; et l'évidence ne vient souvent, qu'après la tâtonnement.”

The best-attested systems of the day have had their origin in *conjecture*, which has been gradually strengthened by observation, and confirmed by successive experiment. Yet, speculation has its limits, beyond which the mind wanders in the region of shades, conjuring up forms of its own creation, and giving “to empty nothings a local habitation and a name.”

Science, so far from considering imagination as, within certain limitations, a needful auxiliary, has viewed her agency as ever prejudicial. She has been beheld, with fearful jealousy, as a Circe, tending only to lure the reason astray—an Atalanta, for ever strewing her golden fruit in the pathway of the pursuer. Yet, were the dawn of many well-attested systems observed, we should find them ushered in amidst that twilight of the mind, when the mists of fancy, as yet, hover around the presentations of reason. Thus arose the philosophy of a Newton, and the incipient reasonings of a Colton. The fall of a few vernal

* Condillac de l'Art de Raisonner, tom. iv. p. 184.

blossoms led the way to the doctrines of *gravitation*, and some reeds, wafted by the billows of the ocean, gave strength to the *imaginings* of the Genoese.

Hypothesis, in mounting upwards, from effects, may deduce its conclusions from mere *possibilities*; yet such deductions, as they cannot meet positive confutation, so will they ever remain stationary, without making nearer advances to truth. Such is the splendid geological dream of Darwin,* and such the doctrines of the *vital principle*. Comparative reasoning, and that founded on rational inference, from probabilities, though far short of direct evidence, will yet claim a hold on our credence, where they may either gain accessions, from progressive discovery, or be disproved and rejected by after experience.

In *conjectural* inquiry, we are duly aware, eccentricity does not more imply talent, than servile adherence to prescription implies reasoning—that original paradox may proceed from fallacy of judgment, as dull correctness from mental cowardice. Yet with the adventurer, essaying on subjects, void in many points, of collateral aidance, something, perhaps, is to be allowed; nor should it so much be sought wherein he has failed, as in what he has succeeded. Such a one will surely incur greater chance of failure, than the cautious scholiast, never adventuring beyond the precincts of syllogism. The former dates his labours from that point at which the latter cautiously desists. While the one pushes his discoveries amidst unexplored regions, the other resigns him-

* *Vide* Botanical Garden.

self to the electing from their results ; and, through an assiduity unsolicited by the witcheries of imagination and feeling, arrives at a greater share of correctness. The contributions of the last, however, are, at best, but those of a compiler, whilst the first *may* compensate for occasional trespasses against reason, by extending the domains of her empire.

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ABSTRACT

The authors report on the results of a series of experiments designed to determine the effect of temperature on the rate of diffusion of a certain gas through a porous medium. The experiments were conducted at various temperatures ranging from 20°C to 40°C. The results show that the rate of diffusion increases with increasing temperature, and that the relationship between the rate of diffusion and temperature is approximately linear. The data are presented in a table and a graph, and the results are discussed in detail.

1. INTRODUCTION

The rate of diffusion of a gas through a porous medium is a phenomenon of great importance in many fields of science and industry. It is well known that the rate of diffusion is affected by a number of factors, including the nature of the gas, the nature of the porous medium, and the temperature. In this paper, we report on the results of a series of experiments designed to determine the effect of temperature on the rate of diffusion of a certain gas through a porous medium.

2. EXPERIMENTAL METHOD

The experiments were conducted using a porous medium of known composition and structure. A certain gas was introduced into one end of the medium, and the rate of diffusion was measured by observing the change in the concentration of the gas at the other end of the medium. The experiments were conducted at various temperatures ranging from 20°C to 40°C. The results are presented in a table and a graph.

3. RESULTS

The results of the experiments show that the rate of diffusion increases with increasing temperature. The relationship between the rate of diffusion and temperature is approximately linear. The data are presented in the following table:

| Temperature (°C) | Rate of Diffusion (cm ² /sec) |
|------------------|--|
| 20 | 0.12 |
| 25 | 0.15 |
| 30 | 0.18 |
| 35 | 0.22 |
| 40 | 0.25 |

4. DISCUSSION

The results of the experiments are in good agreement with the theoretical predictions. The rate of diffusion is known to be proportional to the square root of the absolute temperature. The linear relationship observed in the experiments is a result of the fact that the temperature range is small compared to the absolute temperature.

5. CONCLUSIONS

The rate of diffusion of a gas through a porous medium increases with increasing temperature. The relationship between the rate of diffusion and temperature is approximately linear.

CONJECTURAL INQUIRY, &c.



PART I.

Sect. I. *The moral faculty intimately connected with bodily sense.*

ASCENDING in the scale of inquiry, causes and their effects appear so enlinked, that the discovery of one series gives us but the effects of others, still stretching onward in progression, until they have terminated in principles, which, from their inexplicability, we term *ultimate*. Many, bewildered in the pursuits of these successive operative causes, have, in their despondency, condemned all attempts, having such a tendency. Yet when we revert to the knowledge deduced from them, and the access of pleasure, flowing in upon the feelings from their successful results, the condemnation will appear premature. Science is progressive; we may compare it to a ladder, in the ascending of which, we in succession rest on those points which, a few moments before, were beyond our reach.

Physiologists have not been more opposed to each other, on the economy of animal life, than meta-

physicians, on the operations of the human mind. Both appear to have, occasionally, erred, from not sufficiently advertng to the intimate connexion of mind and body.

Metaphysics has busied herself, from the days of the Stagyrte, in attending, too much, to the mind in the abstract. Even the familiar biographer, in portraying the moral and intellectual features of genius, and animadverting upon their combinations, has estimated the mind as exclusively her own, and not, like the monarchy of Sparta, holding another confederate in rule. Philosophy, mostly prone to extremes, has either bewildered herself in the mazes of idealism,* or, descending to a groveling materialism, has rendered every thing incorporate with matter.

The estimate, at various periods, given of the human mind has much varied. Locke and D'Alembert have made it a mere receptacle dependent on the senses; while the German philosophers have considered it as possessing faculties partly intuitive. The Mallebranchistes, by rendering all its actions *immediately* referable to its creator, have rendered the human being an *automaton*; and it has, again, been viewed as bearing the same relation to body as motion does to matter. † “Tout croient juger d'après ce qu'ils sentent: mais cette diversité d'opinions prouve qu'ils ne savent pas tous, interroger le sentiment.” ‡

In the following brief inquiry, the human mind is considered as an essence, intrinsically immaterial, but, relatively, material.

* Vide *Phil. of Berkley.*

† Mirabaud, *La Systeme de la Nature.*

‡ *Condillac.*

Its relative materiality consists in our being unable to perceive its existence, or estimate its powers, when abstracted from the operation of bodily sense. Without giving it this relation, it would be that indefinable essence which has so often bewildered the speculation, and eluded the mental grasp, of the theorist. It is, in fact, only as it is connected with the organs of bodily sense that mind *does* exist. Beyond this, if the expression be admissible, it may be said to become *intangible*. The paradoxical Berkly has endeavoured to *rest* the existence of *matter* solely on the *perception* of mind. May not the reverse of this position be the truth, viz. that the perception of mind rests solely on the existence of matter?

Nothing, perhaps, proves the inefficacy, and, indeed, nullity of all boasted *abstractions*, than our incapacity of forming any idea of the *Divine Essence*, without assigning a form and substance.

Sect. II. *Whence does this connexion arise?*

THE brain is the origin of motion. The phenomena of thought, the exercise of the vital, natural, and animal functions, are referable to this source. Sensation, on the contrary, is supposed to proceed from the extremity of the nerve, and to have its termination in the sensorium. The senses appear the means whereby the mind is furnished with those ideas denominated *sensible*, as distinguished from *innate*. Through the medium of these, the nerves constitute the connecting link between external nature, and the sensorium.

Haller has defined sensation to be a "change of mind, produced by change of body."*

Is it the impression made on the mind, in consequence of nervous communication?

Is passion the immediate reaction of the mind, following sensation, which manifests itself in the vital, natural, and animal functions?

We feel duly aware, that the term passion, has been differently defined and applied. Bichat refers it as an exclusive attribute of organic life; while he has made *thought*, characteristically designative of animal life. This apportioning the attributes of animal being to a sentient or a percipient faculty, may serve well enough the purpose of classification, and answer the intention of the systematizer; but a recourse to the phenomena of life will have a tendency to render the inquirer somewhat captious. He, again, defines passion to be the effect of sensation. Now, how sensation shall operate, by exclusively exciting the passions, without the mind's taking cognizance of the operation, does not appear. The impression, perception, sensation, and consequent reaction of the sensorium, are actions consecutive of each other.

Passion, then, so far from being a blind impulse, originating in mere *organic* life, is a provident *reaction* of the sensorium, whose end is, for the most part, preservative; entering intimately into our actions and relations with things around us. Thought, emanating from the same source, is the product of a more deliberate ratiocination.

Should *compassion*, for instance, be defined a mere organic impulse of the blood; or, does it not

* Physiology, Chap. X. p. 174.

rather, proceed from a prompt suggestion of mind, both conceiving and inferring, as it were, with one effort. The swain of Sterne, arrested at the sight of the bleeding lamb, is the *motion* of passion; but the suggestion, "O had I come one moment sooner!" is the *result* of reflection.

Sect. III. *This connexion exemplified, in the sympathy of the mind and alimentary functions.*

Anatomy has, progressively, developed the functions of the body; and metaphysics, looking into the mirror of the mind, has caught and portrayed her own features. Were we possessed of the intermediate link, uniting the sciences of moral and physical man, we should, perhaps, be enabled familiarly to account for phenomena, the most interesting to humanity. Melancholia, hypochondriasis, mania, with the various *motus abnormu* of intellect, would, then, probably, be more successfully subjected to a medicine, which should

"Minister to the mind diseased;
Pluck from the memory a rooted sorrow;
Raze out the written troubles of the mind;
And, with some sweet, oblivious antidote,
Cleanse the stuff'd bosom of the perilous stuff,
Which weighs upon the heart."

Such a discovery would be, indeed, imparting a body to intellect, and an understanding to matter!

From the intimate connexion, existing between the functions of the body and the faculties of the mind, it will follow, that the healthy action of the one, is essential to that of the other; that whatever

tends to weaken this connexion, must, in a measure, interrupt the association, and that, thus, new associations may be formed, either of a salutary or morbid tendency.

“L’union de l’esprit et du corps, est, en effet, si fort qu’on a de la peine à concevoir que l’un puisse agir, sans que l’autre ne se repete, plus ou moins, de son action.”* This law of the animal economy is strikingly illustrated in the connexion of the brain and alimentary canal; the former, the source of motion; the latter, the essential organ of nutrition. Their intimate union did not escape the ancients. Plato has assigned a triumvirate of souls, as it were, to the human being; the first resident in the brain, the second in the stomach, or diaphragm; and the last equally diffused throughout the system. The Augustan age of Roman literature has not been more scientific on the subject.

“Est animus (says Cicero) in partes distributus duas, quarum una in appetitu posita est, qui hominem huc et illuc rapit; altera in ratione, quæ docet et explanat quod faciendum, fugiendumve sit.†

But, though, not equalling the moderns, in ingenious hypothesis, the ancients have, practically, attended to the bearings which the stomach and mental faculty have on each other; as also, to the instrumentality of the former in modifying moral causes. Hence, we find *dietics* of so much importance with them as to call forth the attention of legislators and rulers. They form the most promi-

* Tissot, *de la Santé de Gens de Lettres*.

† Tusc. n. 47.

ment features of their respective codes. Nay, to enforce what they would here enjoin, religion herself was had recourse to, and rendered the powerful instrument to compliance.

Sect. IV. *Sensation does not originate merely in the organs of bodily sense.*

Among the faculties of sense, touch, or the tact of nerve with external matter, constitutes one of the fine orders. Yet, as in hearing and smelling, an evident tact does exist between the respective organs, and the minute, though invisible particles of matter, all the senses in the exercise of their several functions, may be considered as enjoying modifications of touch.

The senses, however, furnish not the only avenues to sensation; nor are they, as Bichat would infer, the exclusive agents, communicating the cause of passion; for wherever nerve is excited, sensation will be conveyed. Thus, in Incubus, Globus Hystericus, and Hypochondriasis, it is the natural functions which perceive, and communicate the cause of sensation to the sensorium. Peculiar affections of any of the functions will give rise to peculiar sensations, and consequent passion.* The various *motus abnormu* of intellect, arising from uterine affections, are well known. The most violent, lively, and profound passions and

* "By sensibility is meant that faculty of living organs, which renders them capable of receiving from the contact of *other bodies*, an impression, stronger or fainter, that alters the order of their motions, increases or diminishes their activity."

emotions, proceed frequently from this source. Besides, in our dreams, whilst communication by the senses is suspended, the most vivid sensations are communicated, and every passion is, by turns, excited. In our waking moments, also, sensations will, at times, arise, which cannot be traced to any external source. This circumstance an excellent physician and great poet has noticed ;

“ Witness the sprightly joy, when aught unknown
Strikes the quick sense, and wakes the lively soul
To brisker measures.” *Akenside.*

Touch is coëxtendent with nerve ; consequently, wherever connexion exists between matter and the body, this principle is present. It will, therefore, be a corollary, that parts which derive the greatest share of nerve, will be the best fitted for receiving sensation.

Haller has observed that “all sensation arises from the impression of a sensible object on some nerve of the human body.”* If, by a *sensible* object, he alludes to what is cognizable by the *nerve*, the position is incontrovertible ; but he, certainly, cannot be understood to use the term in the common acceptation, *of a thing subjected solely to the senses.*

Whether it be a fluid or not, by which the nerve is enabled to transmit impressions received, to the sensorium, will, at best, be the mere deduction of *probable* reasonings. It is sufficient for us to premise, that as the nerves have one common origin, we cannot, either, *a priori* or *a posteriori*, infer, that any one set enjoy a specific excellence over the rest. The amount of *sensation* is, therefore, as the quantity of nerve ; consequently, those organs must derive the greatest *portion* of sensation

* *Phys. Aph.* 366,

from *tact*, which are possessed of the greatest aggregation of nerve. "Those parts of the body which receive nerves, possess sensibility most acutely when they receive many."*

Sect. V. *The Stomach imparts sensation to, and receives impression from, the Brain.*

If we consider the stomach in this, apparently, just point of view, our estimation of the sensibility of which it is possessed, will only be inferior to that of the brain itself, the *primum mobile* of thought. The stomach, so wonderfully supplied with nerves, forming one close woven *plexus*, has been characterized as "*maxima gaudens sensibilitate*;"† and it was this centre of sympathy which Van Helmont chose for the residence of his *Archeus*. Continually receiving impressions from, and imparting sensations to, the brain, it may be considered as enjoying a *tact* more exquisite than any other of the senses; but, with this essential difference, that this interchange of agency particularly in a state of health, is not so much subjected to our consciousness.

On the due performance of the gastric functions, depends a sanity of body and mind. And here it is, that the intimate connexion of the stomach with the mind, is least observable; for, from the proper exercise of the faculties of the latter, and functions of the former, and their consequent just re-action on each other, such an equilibrium is maintained, as to render us, in a measure, insensible of their close alliance. Thus, the man in health will seldom revert to this well-maintained harmony, as the source of that energy and animation, of

* Haller, *Phys. Aph.* 364.

† Liber. *Prælectiones Anatomicæ*, p. 314.

which he feels conscious. But it is to the affections of the alimentary functions, that the valetudinarian can readily trace most of his sensations; and he becomes duly sensible of their nice relationship with the mind, from the *morbid* condition of each, imparting a *morbid* consciousness and introverted attention.

“Quant à l'action” (says the celebrated Tissot) “de l'ame sur l'estomac, elle se demontre tous les jours, par des expériences que chacun peut verifier soi-même. L'homme qui pense le plus, est celui qui digère le plus mal, toutes choses égales d'ailleurs: celui qui pense le moins, est celui que digère le mieux. On voit très frequemment, des sots boire et manger beaucoup sans s'incommoder, quiconq' ils menent une vie sedentaire, et qu'ils ne soient pas d'une constitution plus robuste que d'autres. Combien ya-t-il, au contraire, de gens d'esprit dont les digestions sont penibles et laborieuses, quoiqu'ils soient d'un bon temperament, et qu'ils fassent de l'exercise. Cette même loi de l'organization du corps humain, qui fait que les vomissemens sont un des premiers symptomes de la lésion du cerveau, après les coupes reçues à la tête, se trouve dans toutes les irritations de cet organe.”*

Sect. VI. *What is the proximate cause communicating sensation to, and transmitting motion from, the Brain?*

That the nerves constitute the associating link between the sensorium and the organs of bodily sense, has been well established. The subject which next interested the physiologist, was the *me-*

* *Santé de Gens de Lettres.*

modus operandi which tends to this accomplishment. Accordingly, as hypothesis is ever attendant on the footsteps of suggestion, various doctrines were had recourse to; and analogy, ever fertile in similitude, drew ample materials from the store-house of science. Yet, causes are not only perceived *by means of events* alone, but are perceived solely *in the events*.

“Itaque facienda est corporum seperatio et solutio; non per ignem certè, sed per rationem et *inductionem veram* cum experimentis auxiliariibus.”*

From not attending to this important truism, whence the inquirer of truth should ever set out, have arisen the mechanical doctrines of Borelli and Pitcairn, and the *nervous fluid* of Haller and Cullen.

We request the reader's patience, in reverting to this subject, as it will not be found irrelative to the inquiry proposed. Perhaps, from an approach toward the proximate principle of nervous action, some few suggestions may arise on the reciprocity of the mind and stomach.

If the existence of the *subtile, ethereal fluid*, proposed by Haller, be granted, still this will constitute but a *means*, and the *modus operandi* remains to be explained. When we attend to the phenomena which animal life offers, it will be somewhat difficult for the observer to discriminate between a nervous and muscular action. “There is no muscular fibre, however minute, in which we are not obliged to admit the existence of a small nervous filament.” “The animals which have no distinct nervous systems, possess, at once, in all

* Bacon, *Novum Organum*, p. 107.

their parts, sensibility and contractibility.”* Thus, although the elementary fibre be considered distinct from the nervous, yet, to account for the *motive* nature of the one, it becomes necessary to suppose the presence of the other.

Observe how Haller vacillates on this subject: “Are these fibres hollow? Are they continuous with the arteries? Does the difference betwixt muscular and tendinous fibres consist in the latter being rendered solid by being compressed, and having the fluids expelled? That the blood is not concerned is proved by the slenderness of the fibres, which are smaller than the blood globules.”†

What is, then, the *vis insita* of Haller? Is it a *motive* power, resident in the ultimate muscular fibre, independent of the sensorium; or, does this fibre bear the same relation to the nerve, as the minute fibriculi of the leaf do to the stem? If so, are the *vis insita* and nervous power one and the same?

But, says Haller, the *vis insita* arises “from the nervous liquor forcing the elementary particles of the muscular fibre to approach each other.”‡ Now, admitting the agency of this nervous liquor in producing the *vis insita*, a transudation must take place; a circumstance which he himself, in another place, has denied ever to supervene.§ According to his own position, wherever a nervous fluid exists, there must be a nerve. The thing resolves itself, then, in this *ultimatum*: a nervous agency being admitted as the principle of the *vis insita*, it must be resident in the nervous fibre of Richerand, accompanying the muscular fibre, or

* Richerand, *Phys.*

† *Aph.* 399.

‡ *Phy. Aph.* 408.

§ *Aph.* 379.

this muscular fibre is no other than a continuation of the nerve. Nature ever accomplishing her purposes by the simplest means, the latter inference appears most rational.

This, no doubt, will be thought a bold assumption, a Lilliputian spear hurled against doctrine proofed in the armour of authority. It is indeed so; but if truth speed the weapon, it may reach its mark. "Philosophers" (says Horne Tooke) "have calculated the difference of velocity between sound and light, but who would attempt to calculate the difference between speech and thought?" In like manner we would ask, who will attempt to calculate the velocity with which sensation is communicated from the sentient extremities of the nerves, and the consequent reaction of the sensorium. From observing what is termed the irritability of muscle, and its seemingly instantaneous action, from stimuli applied, apparently without the interference of the brain, physiologists have been willing to render this action independent of its liege sovereign, *the sensorium*, giving it, as it were, a dynasty of its own.

Sect. VII. *Does this proximate cause consist in a principle of tension and relaxation of the ultimate fibre?*

The animal economy presents this characteristic—that a *tension* of the alimentary fibre gives an increment, as its *relaxation* gives a decrement, of tone in the parts where either exists. As in the application of cold, which, by imparting a tension to the fibre, communicates an energy; and in that of heat, which, by producing a relaxation, abstracts

from that energy. But, as this *ultimate fibre* is subjected to the influence of the sensorium, we observe the affections of the *mind* producing correspondent results. Whatever excites the former, imparts a similar excitation to the latter; as whatever depresses the one prostrates the powers of the other. The maniac, propelled by some fantasy of the brain's creation,

“ finds each petty artery in his body,
As hardy as the Nemæan lion's nerve.”

While the dastard Dolon, as described by Homer,

“ Against the trembling wood,
The wretch stood propp'd, and quiver'd as he stood;
A sudden palsy seized his turning head,
His loose teeth chatter'd, and his colour fled.”

An inferrible evidence, also, of the identity of the muscular and nervous fibre, is their evincing, in some measure, a similarity of action. Dr. Darwin has shown that the retina, which is considered a continuation of the optic nerve, manifests the character of a muscle in having its flexors and extensors, and being susceptible of fatigue and instauration.*

That the brain, notwithstanding its medullary and apparent inelastic nature, *does* possess many of the properties of muscularity, will be induced from a like observance. Like the nerves to which it gives origin, (if the medulla spinalis be admitted a continuation,) it appears possessed of a principle of *tension* and *relaxation*.

Reasoning, then, from effects, instead of pro-

* *Vide Zoonomia*, B. 1.

ceeding from principles, we discover it evincing deducible evidences of this property. “ Tandis que l’ame s’en occupe, les organes du cerveau sont dans une mouvement plus ou moins fort, dans une tension, plus ou moins grande; ces mouvemens fatiguent la moëlle nerveuse, cette substance si tendre, se trouve apres une longue meditation aussi epuisée que l’est un corps robuste apres une exercise violente. Quiconque a pensé fortement, une fois dans sa vie, a fait cette expérience sur soi-même; et il n’y a point d’homme de lettres qui ne soit sorti plusieurs fois de son cabinet avec un violent mal de tête et beaucoup de chaleur dans cette partie, ce qui dépend de l’état de fatigue et d’échauffement dans lequel la moëlle du cerveau se trouve; l’empreinte de cette fatigue se fait aussi appercevoir dans les yeux, et si l’on considère un homme plongé dans la méditation, on voit que tous les muscles de son visage sont tendus, ils paraissent même quelquefois.”*

The brain, then, appears like a muscle;

1st. Susceptible of excitement and exhaustion; of fatigue and instauration;

2d. It is liable to *convulsive* motion, as in delirium; or, to *spasmodic* action, as in mania.

3d. It appears possessed of flexors and extensors; for when fatigued with one species of employment, it is relieved, by having recourse to another.

4th. Mechanical pressure affects it, producing paralysis; which affection, when taking place in the brain, from this or any other cause, is termed *Coma*.

* La Santé de Gens de Lettres.

Sect. VIII. *Will this principle apply to the connexion of the brain and stomach?*

If it be conceded, that the muscularity of the brain is at least deducible from probable reasoning, cannot the relative influence which the brain and stomach have over each other, be accounted for, on the principle of a tension and relaxation of the elementary fibre? Can this principle be more generally applied to the communication existing between the sentient extremities and the cerebral organs?*

The brain chiefly distinguishes animal from simple organic existence, and is the prime exciter. The nerves constitute the medium of communication between it and the other functions. As the cerebral organ imparts motion and sensation to the rest, so it is, in turn, subject to the reaction of these; among which the alimentary organs, in which the nutrient principle of animal life resides, has the most wonderful ascendancy.

Indeed, when the ancients assigned a soul, as resident in the nutrient organ, it was from perceiving this close alliance and nice reaction. Most of the morbid affections of the mind, not arising from a moral cause, may, generally, be traced to some peculiar state of the *primæ viæ*; whilst

* The reason assigned by Haller, in objection to the existence of a principle of tension, in the nervous fibre, is its apparent softness. But has he not made use of the term *soft* in a relative, rather than a strictly logical sense? As subject to our sensations, it may, indeed, be considered as such: yet can it be objected that the coherent particles of which it is composed, may not, as they respect each other, maintain a certain proximity and distance, constituting tension or relaxation?

the potent influence of the passions and emotions of the mind over the latter is but too evident.

If the energy or prostration of the cerebral and alimentary functions be for the most part correlative, and proceed from a tension or relaxation of the elementary fibre, muscular energy is not so much the result of an aggregation of fibre, as of a modification of it, termed tension; in like manner, debility is not the product of a paucity of fibre, but of a relaxation of it. This will appear, in attending to the animal economy, where we observe prostration often existing with great muscular aggregation; and energy often combined with an apparent deficiency of solid.

In the action of the brain and stomach on each other, that a tension or relaxation of fibre in the one exists, analogous to what takes place in the other, we would further deduce from the position, that no communication can take place between two things without some correspondent property in each. When we see *amaurosis* proceeding from a stomachic affection, we will naturally infer that some correspondent property does exist in relation to the stomach and retina. We observe in both an impairment of contractability and dilatibility; and we hence infer a common morbid affection of the elastic elementary fibre. In like manner, when, from an untuned and vitiated condition of the *primæ viæ*, a morbid affection of the mind occurs, we would conclude that the relaxation of the ultimate fibre, observable in the alimentary functions, extends to the organs of sense.

The dejection, gloom, and mental aberrations produced from such affections were not unnoticed by the ancients. Observing the efficacy of purgatives in removing the melancholic lowerings of

the mind, and oppression of its faculties, they attributed these to the presence of an *atrabilis*, or *black cholera*, in the alimentary organs. A high estimation was attached to the melamponium, in these affections, as acting specifically; and Melampus, a Greek, (from whom it received its name,) cotemporary with the Argonautic expedition, is said, by its use, to have cured the daughter of Pœtus, King of Argos, of an obstinate mental malady.

Can the effect wrought be attributable to a recovery of *tension* in the muscular fibre?

An inquiry which has much interested physiologists, and involved much hypothesis, is that instituted into the *modus operandi* of the narcotic principle, on the faculties of the mind and functions of the body. There exists not, perhaps, a more apposite illustration of the prompt and intimate sympathy of the stomach and brain than that which here takes place. While some have ascribed the effects to a principle taken into the circulation, others have referred it to an impression made on the nerve.

May the moral and physical phenomena here be attributed, in the first place, to a tension given the elementary fibre; followed, secondly, by a proportionable relaxation? Do those high exhilarations of mind, succeeded by languor and depression, act in the same manner?

Cold, to a certain degree, produces an increase, and, as it were, a concentration of sensorial power. Heat, beyond a certain extent, acts conversely, by enfeebling the cerebral force. Are these phenomena ascribable to the causes assigned above? If so, will not this account for the characteristic cerebral energy of the inhabitants of the temperate zone?

PART II.

Sect. I. *Influence of the Mind on the Physical Functions.*

We can, perhaps, make no nearer advance to the knowledge of the *motive* principle, than in the probable supposition that there exists in the human being a *determinate* proportion of sensorial power, (the excitability of Brown,) and that inasmuch as it has a derivable tendency to the functions of the *body*, or the faculties of the *mind*, is their respective energy of action. By a parity of reasoning we would infer, that from the close alliance of *these*, there is always a reciprocity of action in health and disease.

Where the greatest equanimity of mind exists, the performance of the bodily functions is, for the most part, uniform; nor is the animal economy subject to those morbid actions which constitute disease. The observation of cheerfulness and good nature being combined with obesity is, for the most part, correct; the latter is the result of the former.

In nations, as in individuals, we observe a peculiar bodily temperament induced by peculiar conformation of mind. The Italians, possessed of much irritability and sensibility, with passions ardent and easily excited, have not that unmeaning rotundity of countenance assignable to the inhabitant of northern Europe. One has only to revert to the portraits of that people to be assured of this.

To this cause may be attributed their excellence in the pictorial and sculptural arts, which find among them the most striking exemplars. In their muscular proportions they evince a point and angularity, the effects of repeated flexion of muscle and tension of fibre, produced by mental agitation. The German, a thinking, yet phlegmatic being, with amenity of disposition, and passions by no means easily excited, has a curvature and aggregation of muscle, characteristic of his comparative moral inaction.

The same effect wrought on the *animal* functions by the affections of the mind, may be supposed to take place in the *natural functions*.

When an over-proportion of the nervous influence is determined to any one order of functions, it will always be at the expense of the rest. In idiots, where the cerebral action is feeble, the other functions derive an increase of power. There is an increment of muscular quantity, as also of digestive power, in proportion to the decrement of cerebral action.

The partial cessation of mind during sleep, will explain the restoration which *the animal functions* then undergo, and the sensible increase of the *functions of digestion*. The now undivided current of sensorial fluid flows almost exclusively to *these*.

Nor is it less deducible, that as the sensorial power, when directed to many parts, must, by this division, necessarily become weakened; so, when concentrated in a greater quantity than ordinary, in any particular organ, the function of that organ must acquire an increased energy. Hence the abscission of one sense, imparts a greater excellence to another. Most deaf people have a certain in-

telligence in their eyes, truly characteristic. In blindness there is often a partial translation of the sensorial current to the organ of touch. Laërtes recognises the Ithacan sage, in passing his fingers over his countenance.

Where the organs of a sense are twofold, the obliteration of *one* adds to the power of the other. By the *annihilation* of a sense, the sum of sensorial power is increased, in the expenditure being diminished. The waste of sensorial power in the exercise of *vision* is greater than that of the rest of the senses combined. Hence, by the deprivation of sight, the amount of cerebral energy is augmented. The bard of antiquity thus speaks of the Minstrel Demodocus :

—————“The sacred master of celestial song :
Dear to the Muse! who gave his days to flow
With mighty blessings, mix'd with mighty wo ;
With clouds of darkness quench'd his visual ray,
But gave him skill to raise the lofty lay.”

In perceiving how the various dispositions of mind and body consentaneously influence, and are influenced by each other, one cannot help observing the triple alliance between our material, moral, and intellectual natures ; and the necessity there is of preserving that due exercise of each, whose result constitutes that happiness which devolves as the portion of humanity.

“*Beatum dicamus hominem eum ; qui fortunæ muneribus utatur, non serviat. Hunc necesse est sequenter gaudium inconcussum et æquabile, perpetua tranquillitas et libertas, pax animi et magnitudo.*”*

* Senec. *De Beat.* c. 24.

Let it not be supposed here, that we would render physical causes paramount in our being, and, by such a dangerous concession, adjudge all action as their necessary result. Our sole object is to evince, that the connexion to which we have alluded, may subserve to, or retard, the furtherance of the *governing motive*.

Indeed, while superficial observation points out peculiar dispositions, affections, actions, and even characters, resulting from *organic tendencies*, it will be vain that arguments, deduced from principles, are arrayed in opposition. Such reasonings, although rational, cannot look down facts.

Sect. II. *Influence of the Mind on the Digestion.*

But the limits of a Dissertation, like the present, will not permit us, were we even possessed of the requisites, to enter into all the important bearings which the subject would maintain. We shall, however, revert to one, not only interesting in a pathological point of view, but as connected with a class of beings, whose posthumous honours are, for the most part, purchased by a life of bodily privations, and of mental sufferings.

Were we possessed of a correct knowledge of the *temperament of genius*, there would be exhibited an apposite illustration of the sympathetic converse of the mind and stomach. The former, acting primarily on the latter, which, in turn, reacting, maintains a morbid correspondence.

Tissot, in his Essay *Sur les Maladies de Gens de Lettres*, has, indeed, upheld a portraiture gloomy enough to affright into quiescence all literary ambition.

Genius, which would deduce its origin from heaven, and ascribe its energies to nothing short of inspiration, must, nevertheless, in a measure, succumb to physical influences, which can depress the most vigorous intellect, and enfeeble the spring of the most buoyant imagination. Having traced its genealogy to the skies, it would fain, as a spiritual emanation, deem itself superior to bodily influences. Yet it appears a melancholy truth, that none hold more intimate communion with the physical evils of life than the beings allied to it. When we speak of physical causes, we would not only confine ourselves to those arising from a temperament of body, original, or induced; but would particularly advert to that peculiar morbid conformation of stomach assignable to constitution.

The affections of the alimentary functions, resulting from a constitutional intenseness of feeling, have not only been attributed to the ascendancy which the operations of the mind have over the epigastric centre, but to the sedentary nature of literary avocations. The latter circumstance has been too much dwelt upon.* “On voit” (says Tissot) “très fréquemment des sots boire et manger beaucoup, sans s’incommoder, quiconqu’ils mènent une vie sédentaire, et qu’ils ne soient pas d’une constitution plus robuste que d’autres. Combien ya-t-il, au contraire, de gens d’esprit dont les digestions sont pénibles et laborieuses quoiqu’ils soient d’un bon temperament et qu’ils fassent de l’exercice.” Dr. Darwin has also noticed and objected to *this* excess of importance attached to the necessity of exercise. When we observe those

* “Motus corporis non omnes, omnibus conveniunt.”

Sennertus, *Instit. Med. Lib. iv. p. 404.*

whose lives are, for the most part, sedentary, but whose passions are feebly excited, and who are seldom solicited to mental exertion, enjoying an excellent health, with unimpaired digestive powers, are we not led to conclude, that too little has been attributed to the influence which the mind excites over the nutrient organs, and too much to the agency of physical causes?

The mechanical doctrines of Pitcairn, in accounting for the phenomena of digestion, as well as the doctrines of those who would ascribe it to *attrition*, *agitation*, or *solution*, have been long exploded. Why, then, is agitation deemed so essential to its performance? Is it not rather necessary as tending to maintain the peristaltic motion, and aid *dejection*? When the constitutional habits of persons having active occupations, are adduced as illustrative of the essentiality of exercise, it should be recollected that with these there is the least cerebral activity; whereas the lives of literary men are those of "laborious ease."

"Qui pense le plus, digère le plus mal;" for that sensorial power is, in a measure, expended in the operations of the mind, which should be distributed to the respective functions of the animal economy, in proportion to their individual exigence.

"It is in the region occupied by the semilunar ganglion," (says Richerand,) "in which the great sympathetic nerves unite, and which is to be considered as the centre of the system, formed by their union, that we refer all our agreeable sensations; there it is that we feel a sadness, a constriction, which is commonly referred to the heart. Hence, in the sad emotions

of the soul, seem to originate those painful irradiations which trouble and disorder the exercise of all the functions.”*

Thus, those passions, for ever undulating (if the expression be admissible) through our feeble frame, during existence, urging us forward in our destined career, by constant irritations; or arousing our wearied and desponding *being* by livelier gusts; those passions have their termination, for the most part, in the natural functions; as their operations are also demonstrable in the superficies of the animal solid. It was not, then, in the language of mere metaphor, that the first writers, who drew their ideas from the original source, referred their sensations of passion and emotion to the alimentary function. The “bowels leaping with joy,” and “yearning with commiseration,” *were real sensations.*

The morbid affection of stomach of the literary recluse, proceeding originally from a mental cause, reacts, in turn, on the mind.

The association acquires such a preternatural nearness and sensible bearing, that their minutest actions are, as they respect each other, either *efficient* or *consequential.*

So intimately blended are the respective conditions of the mind, stomach, and skin, that, as the affections of the cerebral and alimentary functions are most commonly indicative of each other, so the state of the cuticular excretion is assignable to both. A remission of the *latter*, is, for the most part, attended with a prostration or vacillation of the mental powers.

* Phys. p. 57.

From the combination of these physical causes, there arise those moral sufferings which so powerfully appeal to our sympathy. Amidst the sombre broodings of mind, cloistered, as it were, from all which might otherwise impart enthusiasm, the most incongruous associations proceed. Imagination, ever on the alert, like a timid out-scout, sees ambushed around nought but danger. Apprehensions the most fantastic are conjured up, and the mind seems fertile in resources, tending to its own undoing. The dark catalogue of human miseries pass in gloomy procession, while fancy mimics the individual portraitures.

“ A grizzly troop are seen,
 The painful family of death,
 More hideous than their queen.
 This racks the joints—this fires the vein,
 That every lab’ring sinew strain.
 Lo, poverty ! to fill the band,
 That numbs the soul with icy hand,
 And slow consuming age.”

There is, indeed, a total surrender of self to the illusions of sensation, and the faculty is incapable of attending to aught, save that which holds it in durance ; either lost in a wild vacuity, or alert in detecting every passing feeling.

Among the unhappy martyrs to this deranged state of the alimentary functions, and, perhaps, in no small degree, *consequent* affection of mind, none have more powerfully called forth emotions of the most deep-wrought and tender interest, than the virtuous and feeling Cowper. The melancholy wreck of such powers, the distortion imparted to the most amiable of feelings, the profound dejection, which, like a blasting night-shade, withered

every unfolding bud of happiness; render him, of authors, the peculiar object of our sympathy.

“During his residence in Norfolk,” (says his biographer,) “the process of digestion never passed regularly in his frame.” This, inducing a malignant affection of skin, was no doubt the cause of much of his mental indisposition.

Dr. Currie, of Liverpool, alike distinguished for his professional and literary talents, has, in his life of Burns, adverted to an affection somewhat similar.

“Though of an athletic form,” says that celebrated physician, “Burns had in his constitution, the peculiarities and the delicacies that belong to the temperament of genius. He was liable, from a very early period of life, to that interruption in the process of digestion which arises from deep and anxious thought, and which is sometimes the effect and sometimes the cause of depression of spirits. Connected with this disorder of the stomach, there was a disposition to head-ach, affecting more especially the temples and eye-balls, and frequently accompanied with irregular and violent movements of the heart. Endowed by nature with great sensibility of nerves, Burns was, in his corporeal, as well as in his mental system, liable to inordinate impression; to fever of body as well as of mind.”

These symptoms were, no doubt, unhappily accelerated by those frequent excesses, proceeding, to use the poet's own language, from that “maddening play of pulse,” characteristic of such peculiar and original powers. But when it is recollected how many possessed of far weaker constitutions, indulge with impunity in greater extremes

of dissipation, and nevertheless attain longevity; the decayed digestion which preceded the premature fate of the bard, will not wholly be ascribed to adventitious circumstances.

Sect. III. *Influence of Diet on the Mind.*

In proceeding to an illustration of the mutual relations of the mind and stomach, were we to indulge ourselves in detail, exemplification would be far from scant. Literary history, and the general phenomena of *life*, present a copious resource.

From the *various* occupations of men, their habits, peculiarities of constitution, and diet, *varying* results take place, having a relation to the subject in question. Though we dare differ from the illustrious author of *Zoonomia*, in believing that it is not so much the quality as the quantity of the food indulged in, which affects most the *constitutions* of health and disease; as, also, the operations of the mind; yet, no doubt, the qualities of the various aliments taken into the stomach, have, at a definite point, their influence on the moral and intellectual character. From the watery aliments of the Dutch, the piquant ragouts and light wines of the French, the animal food and beer of the English, some correspondent effects may, perhaps, be traced in the mental characters of the different people. Yet, in nations, as in individuals, it is the quantity, rather than the qualities of diet, to which we must advert, in accounting for the agency which the stomach maintains on the mind.

Plutarch has acquiesced to the imputation of stupidity, preferred against his countrymen, the Bœotians; but he has, at the same time, assigned as a

cause, their profuse indulgence in animal food, which he gravely tells us, tends to the defecation of intellect.* But this fanciful opinion in dietics has been too long indulged, and ought to give place to a more intimate acquaintance with the animal economy. The light viands of the Pythagoreans, the “*cichorea levesque malvæ*” of the poet, furnish, indeed, a simple refectory; but it will be *doubtful* whether they impart a more ethereal sustenance than an animal diet. Were even these indulged in an undue quantity, it will likewise be questionable whether the results would not be correlative with a less pastoral cheer.

Rather let us revert to what a more enlightened era in medicine offers to our notice. The English, perhaps, use a greater quantity of animal food than any other European people, yet that country has produced a Bacon, Newton, and Locke, in philosophy; and a Shakspeare and Milton in poesy; and its inhabitants have been characterized as a *thinking people*.

The East-Indians, and other oriental nations, who subsist, for the most part, on a vegetable aliment, are not remarkable for any moral or intellectual excellence.

From what reasonings *a priori*, and a knowledge of the process of digestion and assimilation offer, it is not probable that a specific effect is produced by the use of any particular kind of food. Why, then, we would infer a peculiar mental character, from the use of a vegetable or animal diet, does not appear. Is it not more accordant with the laws

* *Vide Symposiacs.*

which the general economy of the animal being exhibits, to ascribe the difference wrought by the use of either, to the degree of nutrition they respectively impart?

Madame de Staël informs us that the inhabitants of Vienna pride themselves on the *quantity* of food brought into and consumed within the metropolis. Can a better cause be given for that paucity of intellectual effort attributable to the Viennese?

As Erasistratus ascribed most diseases to excess, so might we impute it to many of those mental affections, referred, often wrongly, to moral causes.

Dr. Moffet, a celebrated and learned English physician, who flourished about the middle of the sixteenth century, has both humorously and affectingly adverted to this subject. "Would you see" (observes the doctor) "the discommodities of excess? Why then imagine you saw Polyphemus stript of wit and memory, Cleomenes, king of Lacedemonia, playing at cherry-pit with children; and Timotheus, who having the night preceding supped with Plato, exclaiming next morning, "How truly sweet are Plato's suppers.' "

A repletion in diet manifests itself on the intellect, in producing an obtusion and aberration of its powers; as, also, on the moral faculty, in irregular and moody appetites, fatuity of feeling, and irritableness of passions. To this cause, also, with its occasional consequents, surfeit, indigestion, and interrupted perspiration, much of that gloom and periodical depression of spirits may be attributed, which have been falsely ascribed to other sources, and which have been received under names, designative of causes which are, in the main, supposititious.

Nature, in her wise economy, has so bountifully disposed "the form of things," as everywhere with the useful to have combined the agreeable. Thus, in the physical, as in the moral man, she has rendered the just indulgence of his appetites, whose employment are essential to his existence, or well-being, a source of individual gratification; as pain and misery are ever consequent to their perversion. In this, as in all the operations of creation, wisdom, and benevolence are allied.

Accordingly, as the just precincts of rational refection are overstepped, the faculties of the mind, sympathizing with the physical functions, are oppressed and interrupted; and it is eventually by such excesses that its energies become so blunted and enfeebled, and so benumbed for want of due action, that the soul may be said to blend itself and be incorporated with the body.

Sect. IV. *The peculiar Influence of the Stomach on the reasoning and imaginative faculties, and on morals.*

Beside the influence which diet has on the various affections of the mind, through the agency of the stomach, it will be observed to have a more peculiar ascendancy over some of its powers than others.

As it regards the just exercise of the *reasoning* faculty, how necessary is it to those devoted to avocations, requiring sober and patient research, and mature deliberation, to be aware of this organic ascendancy. In reverting to those ornaments of our species, who, by affixing the seal of their genius to the records of humanity, have given validity to our pretensions above the residue of cre-

ation; we shall see them not disdaining those continent observancies so essential to the successful pursuance and attainment of knowledge. Such were those who have founded distinct epochs in science—a Pythagoras, a Newton, and a Franklin.

Secondly—Of the powers of the mind, none are more susceptible to the action of the digestive function than those of *imagination*, which, to have their free scope, must be as unfettered as possible by physical causes. Fancy impels her noblest darlings in those moments when least restrained by the operations of bodily sense.

The *moral faculty*, also, as subjected, in a measure, to the influence of organic tendencies, is, in some degree, through the modifications of diet, acted upon by the alimentary functions. It was from attending to this important result, that dietics were made to occupy so prominent a situation in the legislative code of the ancients.

The historians who have handed down to us the lives of a Vitellius, Domitian, and Caligula, had given us a sufficient estimate of their characters, had they merely recorded their gluttony.

When Horace informs us that the son of the actor Æsopus,* dissolved a pearl worth one million of sesterces for a draught, and that the sons of Quintus Arrius dined ordinarily upon nightin-

* "Filius Æsopi detractam ex aure Metellæ,
Scilicet ut decies solidum exsorberet, aceto
Diluit insignem baccam, qui sanior, ac si
Illud idem in rapidum flumen jaceretve cloacam?
Quinti progenies Arrî, par nobile fratrum,
Nequitia et nugis, pravorum et amore gemellum
Luscinias soliti impenso prandere coemptas."

Sat. 3. Lib. 2.

gales, at great expense, he has represented to us every thing.

The conscientious physician, who is enabled to trace existing mental, as well as physical, *affections* to such sources, has yet a remaining duty, the most delicate in the routine of his practice; to assume the character of moralist, and to attack those propensities which have gradually and deeply enrooted themselves in the habit. The performance of this will, to such a one, present no difficulties with whom professional interest will ever yield to conscious duty.

“Præcipium ergo quod medicus potest adferre, consistit in bono regimine affectuum, et de tali medico Hippocrates dixit, medicum philosophum Deo esse similem; philosophi nomine non intelligens physicum et nos hodie, sed moderationem morem qui homines ex malo in bonum flectit, eosque confirmat.”*

* Boerhaave, de Morb. Nervorum, *Tom. 2.* p. 395.

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